

COMMONWEALTH OF PENNSYLVANIA.

DEPARTMENT OF AGRICULTURE.

DAIRY AND FOOD DIVISION.

BULLETIN No. 162.

# BREAKFAST FOODS,

CONTAINING THE

RESULTS OF AN INVESTIGATION OF BREAKFAST FOODS  
AND PANCAKE FLOURS ON SALE IN THE  
MARKETS OF PENNSYLVANIA.

ANALYSES MADE BY

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ASSISTED BY

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N. B. CRITCHFIELD, *Secretary of Agriculture.*  
JAMES FOUST, *Dairy and Food Commissioner.*  
OLIVER D. SCHOCK, *Assistant Dairy and Food Commissioner.*



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## PENNSYLVANIA DEPARTMENT OF AGRICULTURE.

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## PREFACE.

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The following investigation of the breakfast foods on sale in Pennsylvania was made in view of the wide-spread interest which the people of this State have shown in the various statements publicly disseminated to the effect that foods of this class are largely composed of worthless substitutes for food materials and of low-grade materials; because of the very common idea that many of them are injuriously adulterated; and also for the purpose of determining what basis of fact there is to support the extensive claims made for many of these foods by the manufacturers.

N. B. CRITCHFIELD,  
Secretary of Agriculture.



## **DEPARTMENT OF AGRICULTURE, DAIRY AND FOOD DIVISION.**

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Harrisburg, Pennsylvania, January 27, 1908.

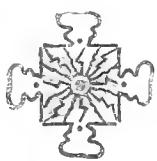
To Whom It May Concern:

The following report on the composition of breakfast foods and pancake flours is respectfully presented for the information of all interested in the sale and use of such food products.

It is believed that the results will prove of special interest to all who have been led to believe, on the one hand, that the numerous articles sold as breakfast foods are made from worthless substances or are injuriously medicated, and, on the other hand, to such users of these materials as have been induced by the advertisers' claims to believe them to possess special virtue above ordinary cereal products, and to be an economical source of nourishment.

Very respectfully yours,

**JAMES FOUST,**  
Dairy and Food Commissioner.



State College, Pa.,  
December 13, 1907.

Hon. James Foust, Dairy and Food Commissioner, Harrisburg, Pa.:

Dear Sir: I submit herewith a summary of results obtained in the examination of breakfast foods undertaken by your direction.

The purpose of the examination, as shown in your directions, has been to determine the correspondence of the package contents to the label, the freedom of the respective products from the types of adulteration commonly occurring in cereal preparations and, in general, the nutritive values of the foods examined.

No attempt has been made to determine the correctness of the label statements, respecting the methods of preparation used in manufacturing the respective products, except statements relative to the removal of indigestible parts and to the malting or predigestion of the materials.

The chemical analyses reported below are not in all cases complete as it has not been deemed desirable to make determinations unnecessary to the discovery of the facts sought. The chemical analyses have been made according to the usual official methods, except where otherwise specifically stated.

In view of the very large claims made by the manufacturers for many of these breakfast foods and, on the other hand, in view of the very widespread notions, as shown by correspondence referred to my office, that certain of these foods are powerfully medicated and that many of them are extensively adulterated with worthless materials, such as corn cobs, corn stalks, wheat bran, etc., the examinations have been conducted in such a manner as to ascertain, as far as possible, the truth or falsity of these claims and notions.

As the foregoing paragraphs suggest, the investigation has been purely chemical and microscopical. The determination of nutritive values has been confined to ascertaining what the ingredients of the foods are and whether or not they are normal in composition. No attempt has been made to compare their digestibilities and nutritive values by direct physiological experiments. It is believed, however, that there is in existence a sufficient volume of facts established by experiment to show how far differences in milling, cooking, etc., alter the digestibility of the respective cereal products.

Freedom from insect invasion and destruction is an important condition for merchantable breakfast food. Many of the samples, when opened for examination, were found to be infested, and many of them exhibited evidences of very extensive destruction. This was true, however, not only of packages that were manifestly shelf-worn, but of many that were fresh in external appearance. In view of the fact that these samples had been shipped in the same case with many other samples and had necessarily been stored for a time in the same lock-closets prior to examination, and also to the well-known fact that the insects causing such destruction are able to pass rapidly from package to package and equally well work their destructive effects, it has seemed fairest not to make a specific re-

port with respect to the particular samples found infested, lest injustice be done to dealers and manufacturers whose goods were sound when sold to the agents.

As far as the products examined, lend themselves to simple classification, they will be reported under the name of the grain from which they are chiefly derived.

### Oat Products.

Seven samples of rolled and crushed oats were submitted.

Agent's No.	Name of Manufacturer.	Name of Cereal.	Name of Dealer.	Price per pkgs. Cents.
H. L. B. 2655,	The Great Western Cereal Co., Chicago, U. S. A.	Mother's Crushed Oats,	Buck & Russell, Altoona, Pa.	10
W. A. H. 3701.	The American Cereal Co., Chicago, U. S. A.	Rolled Avena, .....	J. S. Klinger, Reading, Pa.	10
W. A. H. 3709,	Quaker Oats Co., Chicago, U. S. A.	Quaker Oats, .....	R. Lindel, Reading, Pa.	10
W. A. H. 3710,	The Great Atlantic and Pacific Tea Co., New York City.	Grandmother's Crushed Oats.	The Great Atlantic and Pacific Tea Co., Lancaster, Pa.	10
W. A. H. 3720,	The American Cereal Co., Chicago, U. S. A.	Banner Rolled Oats, ...	J. F. Tooley & Co., Bloomsburg, Pa.	25
W. A. H. 3726.	Austin Nichols & Co., New York City.	Nichol's Pure Crushed Oats.	D. R. Eckman, Danville, Pa.	12
W. A. H. 3732,	The Pawnee Cereal Co., Buffalo, N. Y.	Paw-nee Rolled Oats,	Gohl & King, Williamsport, Pa.	12

In preparing oats for human consumption, mechanical processes are employed to free the grain from dust, and also from the hull, which is, on the contrary, regarded as unobjectionable when oats are fed to domestic animals. To promote the ease of preparation in the kitchen, it is customary in some factories to parch and steam the oats, so as to accomplish a portion of the cooking operation.

All of the oats examined were practically free from hull and all showed the tissues typical of oat kernel. Microscopical examination did not show such differences as to make possible a judgment as to the degree of cooking to which the respective products had been subjected. No foreign materials were found by the use of the microscope. The average composition of the kernel of American oats is as follows:

	Highest per cent.	Lowest per cent.	Average per cent.
Moisture, .....	13.5	8.9	11.0
Ash, .....	3.6	2.0	3.0
Protein .....	14.4	8.0	11.8
Fiber, .....	12.9	1.5	9.5
Nitrogen-free extract, .....	66.9	53.5	59.7
Fat, .....	5.8	3.4	5.0
	.....	.....	100.0

The national standard for oat meal requires that it contain not more than 12 per cent. of moisture, not more than 1.5 per cent. of crude fiber, not less than 2.24 per cent. of nitrogen, and not more than 2.2 per cent. of ash.

For comparison the following statement of composition for the several materials examined in this investigation are given below:

### Composition of Oat Preparations.

Manufacturer and Brand.	Agent's No.	Gross weight, Oz.	Net weight, Oz.	Moisture, Per cent.	Protein, Per cent.	Ash, Per cent.	Fiber and starch, Per cent.	Fat, Per cent.
Great Western Cereal Co's, Mother's Crushed Oats, .....	H. L. B. 2655, ...	33.1	29.2	9.27	14.00	1.55	68.72	6.46
The American Cereal Co's, Rolled Avena, .....	W. A. H. 3701, ...	24.8	21.4	9.24	15.81	.....	68.36	6.59
Quaker Oats Co's, Quaker Oats, .....	W. A. H. 3709, ...	32.0	30.0	8.53	14.62	.....	69.69	7.16
The Great Atlantic and Pacific Tea Co's, Grandmother's Crushed Oats, The American Cereal Co's, Banner Rolled Oats, .....	W. A. H. 3710, ...	33.1	30.9	8.13	14.25	.....	61.63	6.99
Austin Nichols & Co's, Nichol's Pure Crushed Oats, .....	W. A. H. 3720, ...	76.7	65.5	9.09	14.75	.....	69.50	6.66
The Pawnee Cereal Co's, Paw-nee Rolled Oats, .....	W. A. H. 3726, ...	31.5	27.9	9.39	14.25	.....	69.66	6.70
	W. A. H. 3732, ...	29.8	27.0	7.84	14.75	.....	70.05	7.36

These results show in brief that the samples do not contain excessive moisture and that they possess nutritive value fully equal to that of average oat kernels. In common with other breakfast foods they were examined to determine whether or not they had been bleached by the use of sulphurous acid. This examination showed no trace of this bleaching agent.

The weights of the packages show a very general departure from the ordinary units of one pound, two pounds, etc., but no instance of false labelling as to package weight was found among the oat products.

### Barley Products.

For human consumption, barley is stripped of its chaff. The average composition of the naked kernel from American grown barley is approximately:

	Per cent.
Water, .....	6.26
Ash, .....	2.18
Protein, .....	11.77
Fiber, .....	1.60
Starch, etc., .....	75.53
Fat, .....	2.66

100.00

Except as barley is represented, in whole or in part, in some of the so-called malted, breakfast foods, only one barley product appeared among the samples; namely,

Agent's No.	Name of Manufacturer.	Name of Cereal.	Name of Dealer.	Price per pkg. Cents.
W. A. H. 3745,	Ralston Purina Co., St. Louis, Mo.	Ralston Health Barley Food.	F. L. Baer, Greensburg, Pa.	15

The results of its examination showed the following weights of packages and composition:

Gross weight, .....	31.4	oz.
Net weight, .....	29.0	oz.
Moisture, .....	8.86	p. c.
Ash, .....	1.03	p. c.
Protein, .....	10.00	p. c.
Fiber, starch, etc., .....	78.72	p. c.
Fat, .....	1.39	p. c.

The protein, ash and fat seem somewhat below the average for barley, which might be explained by a partial removal of the germ. The microscope showed barley tissues only. One statement in the label—"contains more brain producing elements than any other breakfast food"—requires comment. The statement is not true, since there are other breakfast foods richer in cereal germs that contain more phosphorus. The statement is probably based on the fact that, on the average, barley contains more phosphorus than other cereal grains taken in their entirety.

### Corn Products.

To comprehend clearly, the manufacturing possibilities for corn, and the variations in composition of the products, it is needful to understand the parts into which the grain is readily separable and their differing chemical composition. The grain is roughly divisible into: (a) The bran, or woody portion, consisting of two layers or coats; (b) the germ or chit, situated at the tip end of the kernel but extending in a thin enveloping layer around the entire kernel just under the bran coats; (c) the endosperm, or starchy interior of the grain, which is divisible into two sub-divisions, the flinty part composed of compact cells, and the lighter part composed of a floury or less compact substance.

The composition of these parts, water-free, was found by Voorhees to be:

	Bran—per cent.	Germ—per cent.	Endosperm—per cent.	Whole kernel—per cent.
Ash, .....	1.27	11.13	0.68	1.73
Protein, .....	6.60	21.71	12.23	12.65
Fiber, .....	16.45	2.88	0.65	2.02
Starch, etc., .....	74.09	31.66	84.90	79.26
Fat, .....	1.59	29.62	1.64	4.34

The proportions of these parts differ, of course, in different maize varieties, thus giving rise to considerable differences in the composition of the entire kernel.

The samples received purporting to be corn products were as follows, arranged in groups according to their general character:

### Corn Meal.

Agent's No.	Name of Manufacturer.	Name of Cereal.	Name of Dealer.	Price per package cents.
W. A. H. 3683,..	Quaker Oats Company, Chicago, U. S. A.	Quaker Corn Meal,.....	Mrs. S. E. Reeve, Kingston, Pa.	10
W. A. H. 3707,..	Wertz Milling Co., Reading, Pa.	Corn Meal, .....	Mrs. Jos. Becker, Reading, Pa.	5
	Heminy or Grits.			
W. A. H. 3714,..	Ralston Purina Co., St. Louis, Mo.	Ralston Hominy Grits,..	D. S. Bursh & Son, Lancaster, Pa.	10
W. A. H. 3733,..	The American Cereal Co., Chicago, U. S. A.	FS Pearl Hominy, ....	Gohl & King, Williams- port, Pa.	10
	Cooked Products.			
H. L. B. 2651,..	Toasted Corn Flake Co., W. K. Kellogg, Battle Creek, Mich.	Kellogg's Toasted Corn Flakes.	H. M. Singiser, Al- toona, Pa.	10
H. L. B. 2661,..	The H-O (Hornby's Oatmeal) Co., Buf- falo, New York, U. S. A.	Korn Kinks, .....	Chas. Clark, Altoona, Pa.	10
H. L. B. 2659,..	Egg-O-See Cereal Co., Chicago, U. S. A.	Egg-O-See Corn Flaked and Toasted.	Sauer Bros., Altoona, Pa.	10
W. A. H. 3702,..	American Hominy Co., Indianapolis, Ind.	Toasted Cerealine Flakes.	J. S. Klinger, Read- ing, Pa.	10
W. A. H. 3721,..	The Korn-Krisp Co., Ltd., Battle Creek, Mich.	Korn-Krisp, .....	J. F. Tooley & Co., Bloomsburg, Pa.	15
W. A. H. 3742,..	Postum Cereal Co., Ltd., Battle Creek, Mich.	Elijah's Manna, .....	Jno. E. Zeiser, Erie, Pa.	15

Composition of Corn Preparations.

Manufacturer and Brand.	Agent's No.	GROSS WEIGHT—oz.	NET WEIGHT—oz.	Moisture—per cent.	Ash—per cent.	Fiber—per cent.	Sugars—per cent.	Fat—per cent.
<b>CORN MEAL.</b>								
Quaker Oats Company's, Quaker Corn Meal, .....	W. A. H. 3683, .....	.....	.....	11.12	.32	7.94	80.06	.56
Wertz Milling Company's, Corn Meal, .....	W. A. H. 3707, .....	25.1	23.3	9.14	1.16	9.69	75.73	4.28
<b>HOMINY.</b>								
Ralston Purina Company's, Ralston Hominy Grits, .....	W. A. H. 3714, .....	32.6	30.3	9.43	.77	7.56	80.19	2.08
American Cereal Company's, FS Pearl Hominy, .....	W. A. H. 3733, .....	30.9	28.6	8.26	.32	7.81	82.63	.98
<b>OTHER CORN PREPARATION.</b>								
Kellogg Corn Flake Company's, Kellogg's Toasted Corn Flake,	H. L. B. 2651, .....	13.5	10.8	10.33	*(.66)	6.50	.48	80.02
Egg-O-See Cereal Co.'s, Egg-O-See Corn Flaked and Toaster,	H. L. B. 2659, .....	19.5	16.6	10.70	*(.72)	7.12	.31	79.14
The H-O (Hornby's Oatmeal) Company's, Korn Kinks, .....	H. L. B. 2661, .....	6.5	5.1	10.94	(?.23)	7.06	.28	78.89
American Hominy Company's, Toasted Cerealine Flakes, .....	W. A. H. 3702, .....	12.5	9.8	8.81	*(.77)	7.37	.31	82.46
Korn-Krisp Company's, (Ltd.), Korn-Krisp, .....	W. A. H. 3721, .....	18.2	16.2	9.16	(?.25)	9.00	.81	76.99
Postum Cereal Company's, Elijah's Manna, .....	W. A. H. 3742, .....	25.4	21.7	7.24	1.30	7.12	.33	.22
					*(.02)			

\*Salt.

The corn meal samples correspond in their protein content to average corn meal. The ash and fat in No. 3683 are unusually low.

In the case of No. 3707, a little wheat flour was found, but the quantity was so small as to suggest that its presence was accidental.

Hominy Grits, No. 3714, is unusually rich in fat, doubtless owing to the presence of the embryo. In this sample also, a few wheat grains appear, possibly accidentally. This sample, like all the other corn samples, gave no indication of the presence of sulphurous acid.

The microscopic examination of the remaining corn preparations, gave the following results: No. 2651 showed the tissues from the interior of the corn grain with the starch grains burst and merged. No. 2659 showed the same microscopic characters. No. 2661, which is also discussed under the head of so-called "malted" preparations, exhibited only translucent flakes of starchy corn endosperm whose starch grains had burst and merged. No. 3702 showed the same characters. No. 3721 also exhibited corn endosperm with starch grains chiefly merged. The masses of endosperm were, however, blued by iodon, showing the presence of a good deal of unconverted starch. This product also is discussed under the head of the so-called "malted and predigested" foods, and requires no further mention in this connection. No. 3742 shows an appearance similar to that of the other samples just named.

The composition of these miscellaneous corn products agrees in general with that for products from corn, including the bran and the germ. Some of the figures for the ash are apparently too high, and for salt, too low, but time did not permit the complete checking of the analytical work at this point. No. 3742 shows the presence of some sugar, but owing to the difficulty of exactly determining small quantities of sugar in the presence of dextrin, no satisfactory quantitative results were obtained.

As to the labelling: There seems to be no justification in the analytical and microscopical results for the statement respecting No. 2651, that it is "rich in nutrition because of the preservation of the most vitalizing elements that nature has stored in the corn." It is as rich as usual hominy grits, no richer. The materials most fitted for the maintenance of the body tissues have been eliminated in the milling process, so that the statement can apply with correctness only to the starch. The labelling of No. 2661 will be considered later as also will that of No. 3721.

#### Wheat Products.

The wheat kernel is roughly divisible into the same number of parts as the corn; viz: the bran coats, germ, and endosperm. In wheat milling, the partition is carried farther than with corn, so as to separate, more or less completely, the outer, more highly proteid, ashy and fatty parts of the endosperm, from the more starchy inner portions, which yield the white, patent flour. By the present processes of cleaning, clipping, polishing and milling the grain and of bolting its meal, the mechanical separation of parts can be quite perfectly carried out. Certain rubbing processes permit even the partial separation of the outer from the inner bran coats, though not altogether successfully.

The composition of the principal parts of the wheat is shown by analyses of the following products from Spring wheat:

	Bran. Per cent.	Germ. Per cent.	Low grade flour. Per cent.	Bakers' flour. Per cent.	Patent flour. Per cent.	Entire wheat. Per cent.
Moisture, .....	10.91	8.75	12.01	12.18	11.48	9.66
Ash, .....	5.59	5.45	1.99	.62	.39	1.91
Protein, .....	16.28	33.25	17.95	14.88	12.95	14.18
Fiber, .....	5.98	1.75	.93	.33	.18	1.70
Starch, etc., .....	56.21	35.19	63.26	69.99	73.55	69.94
Fat, .....	5.03	15.61	3.86	2.00	1.45	2.61
	100.00	100.00	100.00	100.00	100.00	100.00

The low grade flour represents roughly the outer portions of the endosperm; the bakers' flour, the parts intermediate between the exterior and central portions of the endosperm. The germ, despite its high nutritive value, is removed from flours to prevent their too rapid deterioration, and because it is hard to pulverize.

The samples received were as follows:

Agent's No.	Name of Manufacturer.	Name of Cereal.	Name of Dealer.	Price per Package-Cents.
W. A. H. 3687..... W. A. H. 3729.....	The American Cereal Co., Chicago, U.S.A. (Not given), .....	Pettijohn's Breakfast Food, ..... Royal Rolled Wheat, .....	Davis Bros., Wilkes-Barre, Pa., ..... Harry P. Young, Williamsport, Pa., .....	12½ 10
H. L. B. 2657..... H. L. B. 2667..... H. L. B. 2673.....	Farina, Minneapolis, Minn, ... Cream of Wheat, Minneapolis, Minn, ... Ralston Purina Co., St. Louis, Mo., 'L.' Pillsbury Washburn Flour Mills Co., Ltd., Minneapolis, Minn.	Cream of Wheat, ..... Ralston Health Food, ..... Pillsbury's Best Cereal, ..... Hower's Wheat Farina, ..... Pillsbury's Vitos Wheat Food, .....	N. R. Gamble & Co., Altoona, Pa., ..... Gable Co., Altoona, Pa., ..... W. L. Longenecker, Altoona, Pa., .....	15 15 15 15 15
W. A. H. 3684..... W. A. H. 3689.....	The American Cereal Co., Chicago, U.S.A. Pillsbury Washburn Flour Mills Co., Ltd., Minneapolis, Minn.	Pillsbury's Vitos Wheat Food, .....	Mrs. S. E. Reeve, Kingston, Pa., .....	10
W. A. H. 3697..... W. A. H. 3700.....	Ralston Purina Co., St. Louis, Mo., ... Hecker-Jones-Jewell Milling Co., New York.	Ralston Health Food, ..... Hecker's Cream Farina, .....	J. Hance, Wilkes-Barre, Pa., .....	15
W. A. H. 3718..... W. A. H. 3724.....	Quaker Oats Company, Chicago, U. S. A. The H.O. (Hornby's Oatmeal) Co., Buffalo, N. Y.	Parched Farinose, ..... H-O Wheat Farina, .....	W. H. Moyer, Reading, Pa., .....	15
W. A. H. 3725..... W. A. H. 3737..... W. A. H. 3741.....	Quaker Oats Co., Chicago, U. S. A., ... Austin-Nichols & Co., New York City, ... The Franklin Mills Co., Lockport, N. Y.,	FS Wheat Farina, ..... Wheat Farina, ..... Wheatlet, .....	C. A. Grim, Reading, Pa., .....	10
H. L. B. 2652..... H. L. B. 2653.....	Other Wheat Preparations. The Shredded Wheat Co., Niagara Falls, N. Y.	Shredded Whole Wheat, .....	H. D. Cromwell, Danville, Pa., .....	10
H. L. B. 2656..... H. L. B. 2658..... H. L. B. 2660.....	The American Cereal Co., Chicago, U.S.A. Jersey Cereal Food Co., Irwin, Pa., ..... Hygienic Food Co., Battle Creek, Mich., Quaker Oats Co., Chicago, U. S. A., .....	Zest, .....	N. S. Lee, Altoona, Pa., .....	10
H. L. B. 2668.....	National Cereal Co., Ltd., Battle Creek, Mich.	Jersey Flakes, ..... Maple-Flake, ..... Quaker Wheat Berries (Puffed and Baked).	Anly Gamble, Altoona, Pa., .....	12½
H. L. B. 2671..... W. A. H. 3688.....	Egg-O-See Cereal Co., Chicago, U. S. A. B. Arendshorst & Sons, Holland Ruskin Co. Inc., Holland, Mich.	Ideal Wheat X-Cel-O Flakes, .....	L. K. Reploye, Altoona, Pa., .....	15
W. A. H. 3692..... W. A. H. 3693..... W. A. H. 3698..... W. A. H. 3703.....	The American Cereal Co., Chicago, U.S.A. (Not given), .....	Egg-O-See, ..... Holland Rusk, ..... Apitizo, .....	Goggin Bros., Altoona, Pa., .....	10
W. A. H. 3706..... W. A. H. 3715.....	Power, ..... The Pawnee Cereal Co., Buffalo, N. Y., ..... The Natural Food Co., Niagara Falls, N. Y.	Power, ..... Gust-O-Triscuit, .....	Gable & Co., Altoona, Pa., .....	10
	Price Cereal Food Co., Chicago, Ill., .....	Dr. Price's Wheat Flake Celery Food, .....	Geo. W. Shaffer, Altoona, Pa., .....	10
	Ralston Purina Co., St. Louis, Mo., .....	Ralston Health Crisp, .....	D. S. Burch, Bros., Lancaster, Pa., .....	10

Agent's No.	Name of Manufacturer.	Name of Cereal.	Name of Dealer.	Price per Package. Cents.
W. A. H. 3717.....	Standard Food Co., Binghamton, N. Y. ....	Nu-Life, .....	Kreidler & Bro., Harrisburg, Pa., .....	10
W. A. H. 3719.....	The Wheatena Co., New York City, N. Y. ....	Wheatena, .....	C. Studebaker, Harrisburg, Pa., .....	15
W. A. H. 3723.....	The Genesee Pure Food Co., LeRoy, N. Y. ....	It, .....	F. P. Purse, Binghamburg, Pa., .....	10
W. A. H. 3721.....	The Great Atlantic and Pacific Tea Co., New York City. ....	Grandmother's Breakfast Flakes, .....	The Great Atlantic and Pacific Tea Co., Williamsport, Pa.	10
W. A. H. 3734.....	The American Cereal Co., Chicago, U. S. A. ....	Go, .....	L. L. Stearns & Sons, Williamsport, Pa., .....	10
W. A. H. 3735.....	C. F. Hardy Co., Ltd., Marshall, Mich., U. S. A. ....	Hardyfood, .....	Jacob Fritz, Erie, Pa., .....	10
W. A. H. 3736.....	The Orange Meat Co., Battle Creek, Mich. ....	Orange Meat, .....	Blass Bros., Erie, Pa., .....	10
W. A. H. 3740.....	The H-O Company, Buffalo, N. Y., Battie Creek, Mich. ....	Vigor, .....	Geo. D. Williams, Erie, Pa., .....	10
W. A. H. 3743.....	Battle Creek Sanitarium Food Co., Battie Creek, Mich. ....	Granose Flakes, .....	Geo. K. Stevenson, Pittsburg, Pa., .....	15
W. A. H. 3744.....	The American Cereal Co., Chicago, U. S. A. ....	Saxon Wheat Food, .....	Kauffman Bros., Pittsburg, Pa., .....	15
W. A. H. 3746.....	Most Co., Inc., Pittsburg, Pa., .....	Most, .....	J. W. Pollins Co., Greensburg, Pa., .....	10

Manufacturer and Brand.	Agent's number.	Weight.		Composition.				Fat—per cent.
		Gross—oz.	Net—oz.	Mositure—per cent.	Protein—per cent.	Fiber—per cent.	Sugars, etc., per cent.	
<b>Rolled Wheat Preparations.</b>								
American Cereal Co.'s, Pettijohn's Breakfast Food, ....	W. A. H. 3687, ....	26.6	23.2	9.66	1.73	11.69	2.42	1.87
(Not given), Royal Rolled Wheat, ....	W. A. H. 3729, ....	27.8	25.0	8.55	1.74	10.19	2.79, 22	2.09
<b>Farina Preparations.</b>								
Cream of Wheat Co.'s, Cream of Wheat, ....	H. L. B. 57, ....	31.7	28.3	10.69	.64	11.75	76.17	.95
Ralston Purina Co.: Ralston Health Food, ....	H. L. B. 2667, .... W. A. H. 3697, ....	31.6 31.7	29.0 29.4	8.49 11.44	1.49 1.34	11.19 10.94	1.97 1.97	1.72
Pillsbury Washburn Flour Mills Co.: Pillsbury's Best Cereal, ....	H. L. B. 2673, .... W. A. H. 3689, ....	34.3 31.8	31.8	9.21 8.74	1.37 1.03	11.06 12.69	78.54 76.56	.82 .98
Pillsbury's Vitos Wheat Food, ....	W. A. H. 3684, ....	16.6	15.2	10.74	.69	11.44	76.41	.72
American Cereal Co.'s, Flower's Wheat Farina, ....	W. A. H. 3706, ....	22.8	20.1	9.78	.56	10.56	78.50	.60
Hecker-Jones-Jewell Milling Co.'s, Hecker's Cream Farina, ....	W. A. H. 3741, ....	32.7	31.4	9.70	1.01	13.31	78.87	
<b>Quaker Oats Co.: Parched Farinose, .... FS Wheat Farina, ....</b>								
W. A. H. 3718, ....	33.3	30.8	8.23	2.03	13.37	1.17	72.77	
W. A. H. 3725, ....	15.7	14.2	10.93	.60	11.69	75.51	1.27	
<b>The H-O (Hornby's) Oatmeal Co.'s, H-O Wheat Farina, ....</b>								
Austin Nichols & Co.'s, Wheat Farina, ....	W. A. H. 3724, ....	16.3	14.6	5.57	.41	12.25	80.65	1.12
The Franklin Mills Co.'s, Wheatfar, ....	W. A. H. 3727, ....	16.6	15.5	10.54	.54	9.60	78.96	.96
Other Wheat Preparations.	W. A. H. 3741, ....	32.7	31.4	9.70	1.01	13.31	1.15	1.92
American Cereal Co.: Zest, ....	H. L. B. 2653, .... H. L. B. 3682, ....	19.2 20.1	16.4 18.0	10.19 7.91	2.23 (?) 3.02	9.07 16.56	1.69 71.83	1.19 .22
Apitzco, ....	W. A. H. 3734, ....	17.9	14.2	8.82	1.92	10.81	1.96	1.46
Go, ....	W. A. H. 3744, ....	34.8	26.5	6.63	2.98	9.32	79.57	1.31
Saxon Wheat Food, ....					* (0.06)			

\*Salt

†Ash included with fiber, starch, etc.

## Manufacturer and Brand.

Agent's number.

	Weight	Composition							
		Gross—oz.	Net—oz.	Moisture—per cent.	Protein—per cent.	Fiber, etc.—per cent.	Ash—per cent.		
Egg-O-See Cereal Co's, Egg-O-See, .....	H. L. B. 2671, .....	16.0	13.4	8.24	2.12 *(.08)	10.87	1.36	76.15	1.18
Genesee Pure Food Co's, It, .....	W. A. H. 3725, .....	19.2	18.0	8.29	2.24 *(.16)	10.44	1.51	76.12	1.24
Battle Creek Sanitarium Food Co's, Granose Flakes, .....	W. A. H. 3743, .....	11.7	8.7	7.26	.78	12.62	.40	77.36	1.58
Great Atlantic and Pacific Tea Co's, Grandmother's Breakfast Flakes, .....	W. A. H. 3731, .....	15.9	13.5	6.79	2.37 *(.08)	10.00	1.62	77.79	1.35
C. F. Hardy Co's, Hardyfood, .....	W. A. H. 3735, .....	15.2	12.1	8.37	1.78	9.44	1.89	77.12	1.40
Holland Thistle Co's, Holland Rusks, .....	W. A. H. 3636, .....	7.9	6.2	7.59	.90	12.44	.32	72.87	.58
The H-O Co's, Vigor, .....	W. A. H. 3740, .....	15.9	13.5	7.31	2.21	14.00	1.85	74.28	.51
Hygienic Food Co's, Maple-Flake, .....	H. L. B. 2658, .....	14.4	11.5	9.83	2.37 *(.06)	9.44	2.01	76.20	1.30
Jersey Cereal Food Co's, Jersey Flake, .....	H. L. B. 2656, .....	15.4	12.2	10.74	2.87	8.40	1.81	75.25	1.33
Most Co's, Most, .....	W. A. H. 3746, .....	15.4	14.3	8.21	1.08	12.25	.25	77.84	.43
National Cereal Co's, Ideal Wheat X-Cel-O Flakes, .....	H. L. B. 2668, .....	13.0	10.7	8.48	2.18 *(.12)	8.69	1.90	77.57	1.06
National Food Co's, Triscuit, .....	W. A. H. 3703, .....	13.6	12.2	8.48	1.80	11.00	2.18	75.06	1.48
Orange Meat Co's, Orange Meat, .....	W. A. H. 3736, .....	17.2	15.1	9.60	2.39 *(.20)	10.31	1.98	74.93	.59
Pawnee Cereal Co's, Gust-O, .....	W. A. H. 3698, .....	12.6	9.2	8.07	(?) <sup>2</sup> .83 *(.02)	10.31	1.32	76.25	1.20
Price Cereal Food Co's, Dr. Price's Wheat Flake Celery Food, .....	W. A. H. 3706, .....	15.4	12.6	7.10	2.16	10.46	1.85	77.14	1.61
Quaker Oats Co's, Quaker Wheat Berries (Puffed and Baked), .....	H. L. B. 2669, .....	10.5	8.3	10.19	1.61 *(.08)	13.06	73.72	1.63	
Ralston Purina Co., Ralston Health Crisp, .....	W. A. H. 3715, .....	18.3	15.9	8.87	2.33 *(.02)	12.81	2.01	73.20	.82
Shredded Wheat Co's, Shredded Whole Wheat, .....	H. L. B. 2659, .....	16.5	14.2	9.45	1.66 *(.02)	11.06	76.41	75.93	1.42
Standard Food Co's, Nu-Life, .....	W. A. H. 3713, .....	15.4	13.3	8.02	(?) <sup>2</sup> .66 *(.04)	9.87	1.60	75.93	.88
Wheatena Co's, Wheatena, .....	W. A. H. 3719, .....	24.9	21.5	8.41	1.73 *(?) <sup>2</sup> .70	11.50	1.03	75.23	2.10
(Not given), Power, .....	W. A. H. 3693, .....	13.9	12.0	7.88	1.12 *(.12)	10.94	1.63	75.83	.55

Microscopical examination revealed no low-grade foreign tissues in samples of the foregoing list, but showed them to be chiefly or exclusively wheat products. The chemical composition falls, in each case, within the usual limits for wheat products. The amounts of salt reported were based upon examinations of the ash, and do not reliably represent the total amount in the food; also, the high ash results obtained in several cases, marked "?," are unusual, though the result in each case was checked.

The claims on the labels of some packages call for comment: No. 3687, Pettijohn's Breakfast Food: The label says "It is particularly adapted for children and persons of sedentary habits....Each grain of wheat is freed from the indigestible outer covering." The first statement is doubtless based upon the fact that foods made from entire wheat are more laxative than those prepared from the inner portions of the endosperm. It should not be understood that such preparations as No. 3787 are medicinal.

No. 2657, Cream of Wheat: The label says "Cream of Wheat....contains a very large percentage of gluten." The analyses of other farinas show the lack of foundation for this vague statement.

No. 2667 and No. 3697; Ralston Health Food: The label says "When you open this package you can see thousands of tiny *almond-colored grains*....These are the true Wheat-hearts, or Seeds-germs of Wheat. And these germs of wheat are full of the Vegetable Phosphorus that makes *children grow like magic and develop strong mentally*. They are what make Nerve-worn people whole again, calm, composed and restful. They are what supply new Mind-Power by providing the brain all the phosphorus it can use in heavy Thinking without exhaustion of the Nerve Cells....They make good the defects in *other Foods* that lack Phosphorus....Remember you can see these Wheat-hearts or Phosphorus germs in this very package of Ralston Health Food....You can't see *them in any other Cereal Food*. Why?" The germs are present here, as they are in Graham flour, and in many other wheat preparations. They are visible in other preparations, contrary to the plain implication of this label. The composition of the food, compared with that of the pure germ, shows low protein and fat; moreover, the phosphoric acid in No. 2667 is only 0.33 per cent., not more than is exhibited by many other wheat preparations, such, for example, as cracked wheat. (See Slosson's report, p. 76, Bulletin No. 33, Wyoming Experiment Station.)

No. 2673, Pillsbury's Best Cereal: This is misbranded, in that the label on the package claims for the preparation a content of 17 per cent. albumen and salts, whereas only 11.43 per cent. of protein and ash is present.

No. 2689, Pillsbury's Vitos Wheat Food: Misbranded in that the label claims 16.64 per cent. of proteids and 3.62 per cent. of fat, whereas only 12.69 and 0.98 per cent. respectively were found.

No. 3718, Parched Farinose: Side label reads, "Rich in Gluten, Germ, Nitrates, Fat and Phosphates." The term "nitrates" is doubtless used here in an obsolete sense referring to all nitrogenous compounds. If nitrates were present in large amount, they would be undesirable constituents. The phosphoric acid content was 0.365

per cent., about the same as in many other germ-containing wheat products.

No. 3725, F S Wheat Farina: The label claims the presence of "nitrates" like that of No. 3718. The same comment applies.

No. 3727, Wheat Farina, is a trifle under the declared weight. In general, the farinas are cracked wheat endosperm, more or less freed from bran coats, free from fine flour, and containing more or less of the germ. Some are cooked or parched, others are sold raw.

The remaining wheat preparations are, with a few exceptions, flaked and cooked, with or without added sauces or flavoring materials. Their analyses show them to be made from whole wheat or some of its products.

The following comments are made for the individual cases whose labels appear to require it.

No. 2688, Maple-Flake: Claims treatment with a blend of cane and maple syrups. The truth of this claim is not readily determined by analysis. Some cane-sugar is present, however introduced.

No. 2671, Egg-O-See: Also claims the use of syrups in its manufacture. Some cane-sugar was found.

No. 3688, Helland Rusk: The label states in large letters "Made in Holland," under a device representing a Dutch windmill; though in small type, it is made known that Holland, Mich. is meant. The label is misleading and the goods are reported as "misbranded," under section 6, paragraph 4, of the Act of June 1, 1907. (See also U. S. Regulation 17, (e), (g), (h) and 19, (b).)

No. 3692, Apitez: The label says: "Apitezo, The Iron Food." The side labels read: "APITEZO" furnishes the best possible" between meals" for children, and should be used instead of white bread, crackers, etc. Richness in Protein—the nerve, muscle and bone builder—and organic iron, which makes red blood, distinguishes Apitez from all other foods. Its relative food value, served with cream, is much greater than meat. ANALYTICAL REPORT OF THE COLUMBUS FOOD LABORATORY, CHICAGO. APITEZO: Protein, 19.00; Fat, .99; Dextrinized carbohydrates and cellulose, 54.67; Grape sugar, 16.00; Ash, 1.57; Moisture, 7.77: Total, 100.00. ANALYSIS OF MINERAL MATTER. Organic iron figured as metallic iron, .10 per cent.; Calculated to *Organic Iron*, 1.00 per cent.; Organic Phosphorus figured as phosphoric acid, .64 per cent. "APITEZO is the best balanced physiologic food that we have examined up to date. The high percentage of protein, the vegetable iron (ten times greater than vegetables), and the richness in organic phosphorus, place this food in a class by itself." Manufactured by The American Cereal Co., Address, Chicago, U. S. A. Is the result of exhaustive research and experiments by eminent food experts in the endeavor to find a rational hygienic food which would give the greatest possible strength and nourishment, and at the same time be naturally and easily digested and assimilated by the weakest system. *Apitezo* is made of the best parts of Grain, combined with Vegetable or Plant Iron, which produced HEMOGLOBIN (the Red or Vital Property of Blood), and on an adequate supply of which depend bodily health and strength as well as mental vigor and activity. The Protein, Phosphates, etc., from the Grains, combined

with PLANT IRON—found heretofore only in plants such as peas, beans, spinach and lentils—make *Apitezo* A PERFECT AND COMPLETE FOOD FOR ALL."

The food is a wheat preparation, free from bran, but rich in germ. The protein is about 2.5 per cent. below that stated in the analysis on the label. Iron was found to the amount of .05 per cent; phosphoric acid, 0.96 per cent. The term "organic iron" here used is misleading; it is used to exaggerate the quantitative importance of the iron content of the food.

No. 3706, Dr. Price's Wheat Flake Celery Food: The label says "One package contains as much food value (nourishment) as three loaves of bread....It is a natural food product, as the whole wheat kernel is used....It's the only cereal food, when eaten daily, that helps to regulate the bowels....All indigestible matter removed."

The flavor of celery is not at all pronounced. Home-made bread contains on the average 35 per cent. of water; the net dry matter in the package of this wheat flake preparation is 11.72 oz.; the digestibility and nutrient composition of bread is no whit inferior to that of wheat flake preparations; hence, the total weight of bread corresponding to the dry matter in this flake food would not exceed 16 ounces, which, if divided between three loaves would, if the label statement were true make each loaf weigh only a trifle over five ounces. The usual market loaf sold for seven cents weighs eighteen to twenty-four ounces, those sold for five cents weigh twelve to fifteen ounces. The statement "All digestible matter removed" is untrue and misleading. Bran and hairs are present, and the amount of fiber is up to the average for flaked wheat preparations. The statement respecting its being "the only cereal food that helps to regulate the bowels" is likewise untrue and misleading.

No. 3719 will be discussed in connection with the so-called 'malted' foods.

No. 3735, Hardyfood: The label states: "Hardyfood is brain, nerve and muscle food. It enriches and purifies the blood, assists digestion and builds up the entire system....Hardyfood is made from the choicest selected grains and cereals....All those portions of the grains and cereals which tend to produce harmful results are removed, and only the nerve, brain, bone, and muscle food retained. It is the only food from which the excess of starch and glucose has been removed, making it especially beneficial for those with impaired digestion. One box of Hardyfood contains more nutrition than FIVE POUNDS OF THE BEST BEEF."

The fourth sentence of the quotation is very general, but implies that all the bran has been removed. That this is not the case is proven by the microscopic examination, which shows outer bran coat tissue, and, by the chemical analysis which shows as much fiber present as the average flaked wheat product contains. The fifth sentence also is very general, and misleading. Starch is present in abundance, as the iodin reaction shows, and the analytical data indicate that *it contains more starch and related bodies than the average flaked wheat preparation.* The sixth sentence is equivalent, since the package of this food contained twelve ounces, to a declaration that one pound of Hardyfood contains more nutrition than six and two-thirds pounds of the best beef. Medium fat round steak has 92.8 parts of edible substance composed of water, 60.7 per cent;

protein, 19 per cent.; fat, 12.8 per cent.; ash, 1 per cent. It has a fuel value of 895 heat units (calories) per pound. The quantities of nutrients contained in 12 ounces of the cereal and 5 pounds of beef may be compared (assuming 1750 calories for the cereal food):

	Protein—oz.	Fat, oz.	Starch, etc.—oz.	Fuel values (calories).
Hardyfood, .....	1.13	.168	9.256	1312
Round steak, .....	15.20	10.24	.....	4475

Moreover, the meat is more highly digestible than the average flaked wheat preparation. Further comment is probably unnecessary to emphasize the recklessness of the manufacturer in his advertised claims, whether they be judged on the basis of the composition, the digestibility, or the available energy content of the two foods.

No. 3736, Orange Meat: The label says "Every particle is absolutely digestible." The percentage of fiber shows that even boiling acid and alkali will not digest all of this food. In fact, both the analysis and the microscopic examination show the presence of bran. The main label is misleading further in that it bears a legend as follows:

ALL ||| ...

SAME

#### MADE IN CANADA

thus implying a foreign origin, an implication which the use of the word in small type does not correct except after careful examination. (See U. S. Regulation 17, (h).)

No. 3743, Granose Flakes: Have been deprived of the outer bran coating, but otherwise represent entire wheat. The labels says: "Granose is a perfect diet in cases of inactivity of the bowels....and will not irritate the sensitive organs of digestion." Graham flour preparations, containing both bran coats, do irritate some delicate digestive systems. It is not certain that the inner bran coats are actually free from all irritant quality.

No. 3746, Most: A roasted wheat flour preparation, with some wheat hairs, indicating the use of other than the highest grade flour in the preparation.

#### So-Called Malted and Predigested Foods.

Since the labels of many breakfast foods claim that the respective products to which they relate are malted and predigested, it is important to consider the meaning of these terms, before studying the foods in detail.

The verb. To malt, in its transitive form, is defined as follows: "To make into malt" (Webster); "to convert (grain) into malt"

(Century); "to cause grain to germinate artificially, by moisture and heat, and become malt" (Standard). In its intransitive sense, it is defined, "To become malt" (Webster); "to be changed into malt" (Century); "to become malt, be converted into malt" (Standard).

To express the meaning of the term more fully, "to malt" in the intransitive sense is for a grain to be moistened, gently warmed to start the germinating process, and then, when the sprout has sufficiently developed, to be dried, to arrest the germination, and finally stirred so that the sprout is broken off. While malt is usually made from barley, it may be made from the other cereal grains. In the course of the germination, there is a marked change in the composition of the grain. The albuminous materials break down into more soluble nitrogenous substances, while starch is acted upon by soluble ferments formed in the grain itself, and is successively converted into dextrin, maltose and dextrose, or grape-sugar; that is, the insoluble starch is converted into a series of decreasingly complex, soluble carbohydrates. The malting process is arrested long before all of the starch of the barley is changed to the soluble substances named.

In the manufacture of alcoholic substances from grains; that is, both in the brewing and distilling industries, malt is used, either alone or with other cereals; and if alone, it is moistened and the soluble ferments are allowed to convert most of the remaining starch into soluble carbohydrates. If it is mixed with other grains, the soluble ferments of the barley, dissolving in the water of the mash-tub, are capable of converting the starches of the meals to which the other cereals are reduced before the mixing. This conversion may be secured either by direct mixing of the malt and the raw cereal or by bringing the latter into a contact with a water extract of the malt. But whatever the method, the verb "to malt" is not applied to this process, which is termed "mashing;" that is to say, the mixing of the malt with another grain, and allowing them to be steeped together, does not justify the use of the participial adjective "malted" to the food product.

When starchy foods are introduced into the digestive canal of the human body, they meet soluble ferments similar to those developing in germinating grains and their starch is thereby converted into the same series of soluble carbohydrates, although at the body temperature, the formation of grape-sugar is relatively more abundant than it is in the mash-tub.

Again, when starch is exposed to the temperature of the bake-oven, it is converted into dextrin, but without the formation of the less complex materials, maltose and grape-sugar, except by wet heat under high pressure. Although dextrin is soluble in water, like grape-sugar and maltose, its properties in other respects are so dissimilar that it should be grouped with starch rather than with the simpler bodies when its physiological qualities are under consideration.

There is no sufficient warrant for the application of the qualifier "malted" to a starch that has been partially dextrinized by heat.

The word "predigested" is ordinarily used in two ways, first, to indicate an over-early and over-hasty digestion, and, second, to signify peptonized or partially digested before being introduced into the

stomach, or, to follow the language of the Standard dictionary, "previously digested, digested before eating." The word *digest* is here used in its physiological sense, and has reference to the conversion of the albumineoids, starches and fats of the foods by the soluble ferments that occur in the digestive tract. It is misleading to say of a food that has been slightly dextrinized in the process of roasting, that it is *predigested*, because the process of digestion has not been employed, and the chemical changes wrought in the food are only in a rough sense comparable to those effected by the soluble ferments.

The samples received were as follows:

Agent's No.	Name of Manufacturer.	Name of Cereal.	Name of Dealer.	Price per pack- age.
H. L. B. 2654,..	The Force Food Co., Buffalo, N. Y.	Force,	M. J. Hissler, Altoona, Pa.,	15
H. L. B. 2659,..	Postum Cereal Co., Ltd., Battle Creek, Mich.,	Grape-Nuts,	Geo. W. Shaffer, Altoona, Pa.,	12 $\frac{1}{2}$
W. A. H. 3685,..	The Malted Cereals Co., Burlington, Vt.	Malt Breakfast Food,	S. E. Reeve, Kingston, Pa.,	12 $\frac{1}{2}$
W. A. H. 3690,..	The Great Atlantic and Pacific Tea Co., New York City	Grandmother's Breakfast Grains,	Lady Wilkes-Barre, Pa.,	10
W. A. H. 3694,..	Malta-Vita Pure Food Company, Battle Creek, Mich.	Malta-vite,	Geo. K. Shoup, Reading, Pa.,	15
W. A. H. 3696,..	National Cereal Co., Ltd., Battle Creek, Mich.	X-Cel-O Malted Wheat Food,	J. S. Klninger, Reading, Pa.,	15
W. A. H. 3704,..	Lambert Good Food Co., Ltd., Marshall, Mich.	Malt-Wheat Biscuit,	C. H. Walley & Bro., Reading, Pa.,	10
W. A. H. 3705,..	Voigts Cereal Food Co., Ltd., Grand Rapids, Mich.	Voigt Cream Flakes,	G. W. Leiss, Reading, Pa.,	15
W. A. H. 3719,..	The Wheatena Co., New York City	Wheatena,	C. Studebaker, Harrisburg, Pa.,	15
W. A. H. 3722,..	The Cero-Fruito Food Co., Battle Creek, Mich.	Cero-Fruito,	L. T. Sharpless, Bloomsburg, Pa.,	10
W. A. H. 3739,..	The National Pure Food Co., Ltd., Grand Rapids, Mich.,	Cera Nut Flakes,	Geo. D. Williams, Erie, Pa.,	10

These samples were analyzed in the same manner as those in the lists earlier presented. The results were as follows:

## General Composition of So-Called Malted and Predigested Foods.

Manufacturer and Brand.	Agent's No.	Weight.		Composition.				
		Gross oz.	Net oz.	Moisture—per cent.	Ash—per cent.	Fiber—per cent.	Salt—per cent.	
The Force Food Company's, Force, Fostum Cereal Company's, Grape Nuts, Malted Cereal Company's, Malt Breakfast Food, Great-Atlantic & Pacific Tea Co's, Grandmother's Breakfast Grains, Malta-Vita Pure Food Company's, Malta Vita, National Cereal Company's, X-Cel-O Malted Wheat Food, Lambert Good Food Company's, Malt-Wheat Biscuit, Viognet Cereal Food Company's, Voight Cream Flakes, Wheatena Company's, Wheatena, Cero-Fruito Food Company's, Cero-Fruito, National Pure Food Company's, Cera-Nut Flakes,	H. L. B. 2954, H. L. B. 2869, W. A. H. 3685, W. A. H. 3690, W. A. H. 3694, W. A. H. 3696, W. A. H. 3704, W. A. H. 3705, W. A. H. 3719, W. A. H. 3722, W. A. H. 3739, . . . . .	16.0 16.7 33.6 18.1 20.7 20.5 20.1 22.5 24.9 18.1 . . . . .	13.4 16.0 32.0 16.0 18.4 12.3 17.1 14.6 21.5 15.5 . . . . .	10.17 6.47 8.08 6.88 8.12 8.17 7.98 8.55 8.41 8.51 . . . . .	2.53 1.67 1.26 1.30 2.07 2.12 1.09 1.81 1.73 2.84 3.05 . . . . .	11.75 *(.61) 1.30 1.35 8.87 8.37 11.37 10.62 11.50 10.19 13.44 8.84 . . . . .	1.88 1.31 1.21 1.64 1.73 1.80 .16 2.12 1.93 1.76 1.77 71.55 . . . . .	74.03 78.08 75.48 77.05 78.09 78.29 79.19 75.47 75.23 75.31 71.55 1.45 . . . . .

\*Salt.

Before discussing the foregoing results, additional analytical data will be presented for the purpose of affording some notion of the degree to which facts correspond with the claims as to the changes wrought in these foods as the result of the 'malting' and 'predigestion' to which they are represented to have been subjected.

The method of examination adopted was, in its general lines, similar to one that is generally employed in the testing of barley malt. It aims to ascertain the quantity of water-soluble matter and the amount of reducing sugar, stated as dextrose, in the water extract. The method as applied to these samples, was as follows: Upon ten grams of the finely pulverized sample, held in a stoppered flask, 150 c. c. of cold water was poured, after a bit of thymol had been added as a preservative. The mixture was shaken frequently during the succeeding twenty-four hours, then filtered upon a hardened filter without pressure. The water extract was examined for its content of solids, salt and reducing sugar. The solids were determined directly by evaporation for 13 days over sulphuric acid at low pressure in a Hempel desiccator. The results were checked by calculations based upon the specific gravity of the solution. The salt and reducing sugars were determined in the usual way. The results were computed on the assumption that the dissolved substances from the 10 grams of the food taken, were uniformly distributed through 150 c. c. of water, of which the filtrate represented only an aliquot part. The results of this special examination were as follows, in comparison with those obtained by the same method on equally dry, finely divided portions of bread crust and bread crumbs:

### Composition of the Soluble Extract.

Brand.	Agent's number.	Water extract (solids), Per cent.	Salt, Per cent.	Salt-free extract, Per cent.	Reducing sugar as dex- trose, Per cent.	Color of solution.
Bread Crumb, .....	.....	11.34	.412	19.93	1.74	Colorless.
Bread Crust, .....	.....	12.79	.412	12.38	1.41	Yellow.
Grape-Nuts, .....	2559	33.75	.930	32.76	7.02	Brown.
Malt-Breakfast Food,	2655	14.01	.082	13.93	4.53	Light brown.
Grandmother's Breakfast Grains,	3690	45.36	.165	43.20	15.63	Brown.
Malta-Vita, .....	3694	16.32	.990	15.53	3.39	Light yellow.
X-Cel-O Malted Wheat Food,	3696	29.73	1.402	28.33	4.47	Colorless.
Malt-Wheat Biscuit,	3704	29.94	.577	29.36	4.29	Light yellow.
Voight Cream Flakes,	3705	26.37	.247	26.12	4.02	Light yellow.
Wheatena, .....	3719	6.18	None.	6.18	21	Colorless.
Korn-Krisp,	3721	18.93	2.622	16.31	5.49	Light yellow.
Cera-Nut Flakes, .....	3739	29.04	.495	28.55	11.07	Yellow.

A comparative view of these results with those commonly obtained from barley malt, will be of value in judging the products, and may be had from a consideration of the results obtained by O'Sullivan in the examination of a barley malt.

He found the following:

Soluble organic matter, .....	25.58
Including,	
Soluble carbohydrates, .....	21.23
Soluble albuminoids, .....	4.34

Of the soluble carbohydrates, about two-thirds was a fermentable sugar, of which about one-half is probably maltose formed from starch during germination; the remainder, another sugar, ready-formed in the barley before malting. Analyses by Richardson have shown in barley 9 to 13 per cent. of water-extract and in wheat, 4 to 7 per cent.

The samples listed in the table giving the general composition of the 'malted' foods all, except No. 3690, No. 3704 and No. 3719, show analytical characters corresponding to those of whole wheat.

The following comments may be made:

No. 2654. Force: The label says "Prepared by a process of careful malting and heating....Force is food with the indigestible parts left out....With Force the work of digestion is half done." In my own work, Force was not included among the samples analyzed to determine the water-soluble extract; but McGill (Bulletin No. 84, Inland Revenue Department, Canada) found 29.60 per cent., of which 7.0 per cent. was reducing sugar, which shows that the converting action upon the starch has progressed to an advanced stage. The statement that the indigestible matters have been left out is, however, not true. The sample contains wheat bran particles, being made from the entire wheat. In fact, the results of digestive experiments with Force (Cf. Word, Maine Station, Bulletin 118) show that its organic matter is about as digestible as that of rolled wheat, though its protein is 9 per cent. less digestible; that is, the action of the heat used in cooking these flaked products acts unfavorably upon the protein, while it makes the carbohydrates more soluble in water. What is true of Force, is true also of the other similar preparations tried. It is fair to remember that the adjective 'digestible' is used in two senses, one relating to the degree to which a substance can be digested, the other referring to the ease or comfort during digestion.

No. 2669, Grape-Nuts: The following extracts are taken from the label:

"A Food for Brain and Nerve Centres.....In the processes the starch of the grains is largely transformed into Grape Sugar.....The human system will absorb a greater amount of nourishment from Grape-Nuts than from a like amount of any other known food.....Dextrose and Grape Sugar, made by Special Treatment of Entire Wheat and Barley.....Brain workers are driven into dyspepsia, nervous prostration and various diseases because of the lack of the kind of food demanded by nature, from which to rebuild the daily loss occasioned by brain and nervous work. Grape-Nuts furnish, in a condensed form, these necessary food elements."

The foregoing analyses show, however, that while Grape-Nuts contain much dextrin, the starch has not been largely converted to grape-sugar. If total energy supplied, or total digestible matter

be considered, cane-sugar is superior to Grape-Nuts as their source, and supplies them more cheaply. As for the other claims, it does seem to be established that cane-sugar and probably dextrose quickly renew the vigor of tired muscles; it is not demonstrated that dextrin has like power. Dried fruits are richer in sugar than are Grape-Nuts.

Concerning Grape-Nuts and Force, certain correspondents have urged the suspicion that they contain morphin and strychnin respectively. We tested carefully for these alkaloids and found none. Merrill (Maine Station) tested them for arsenic and likewise failed to discover any by most delicate tests.

No. 3694, Malta-Vita: The label declares "Pre-digested and ALWAYS READY.....Malta-Vita is the only food containing all the elements, in their proper proportions, necessary to support the human system,....the phosphates of brain makers, the nitrogenous componnds or muscle makers, the carbohydrates or heat makers."

The analyses here reported show the baselessness of this exclusive claim.

No. 3696, X-Cel-O Malted Wheat Food: The label says "One Pound X-Cel-O equals Five Pounds Animal Food." This fiction has been discussed in relation to No. 3735.

No. 3704, Malt Wheat Biscuit: The label says "This unique Malt-Food alleviated Dyspepsia, Diabetes and Sick Headache." This statement respecting the fitness of the food for diabetes is dangerously misleading. That disease requires a diminution of the dextrose-forming food, and this preparation is as rich in such substance as wheat flour preparations.

No. 3705, Voight's Cream Flakes: The label says "It is STEAM COOKED.....The steaming process MALTS it....In a thoroughly MALTED Preparation there can be no starch to cause indigestion; the heating converts the starch into dextrine, a kind of sugar which is EASILY DIGESTED And therefore agreeable to all stomachs."

These statements are misleading in that they misuse the term "Malted" and imply that all the starch has been converted into dextrin, etc. In fact, there remains unchanged far more starch than was converted.

No. 3719, Wheatena: The label states: "By a peculiar process the starch contained in the grain is converted into a soluble substance. ....Being abundant in nitrogen it is one of the most perfect muscle building foods to be found. As it is deficient in starch, the dyspeptic, with whom starch is indigestible, finds comfort from its use. From one standard package of Wheaten twelve pounds of food can be prepared for the table, making it the cheapest cereal food, of any on the market."

In fact, the analysis does not show any more water-soluble matter and reducing sugar than raw wheat furnishes, and the protein is not especially abundant.

No. 3721, Korn-Krisp: The label says: "Korn-Krisp—Malted, Pre-digested, Thoroughly Cooked....One Pound contains more real nutrition than Two Pounds of the Best Meat....Hull has been removed, leaving every particle PERFECTLY DIGESTIBLE....Invalids, and those with weak stomachs and delicate systems can eat it freely, because being perfectly cooked, and all starch converted into grape sugar (predigested.)"

The analysis shows that it has been relatively well dextrinized, but that only a small portion of the starch has been changed to grape sugar. The statement that "all starch has been converted into grape sugar," is recklessly made. No. 2661, Korn-Kinks, is made from corn almost wholly freed from its bran coats.

No. 3722, Cero-Fruto: The label says: "Fruit and Wheat Flakes." Comparative Nutritive Values: Cero-Fruto, 100 per cent.....Beef Steak (Lean), 28 per cent.....Bread, 63 per cent." No flakes of any colored fruit were found, and all particles except those of wheat bran, were rich in starch—which is not characteristic of fruits. There is, however, a slight fruity flavor. The comparison of nutritive value requires no discussion after what has been said on this general subject.

No. 3739, Cero-Nut Flakes: The label says:

"Predigested and Ready to Eat.....made from Nuts and Wheat.....Being predigested, the starch is thoroughly eliminated, making this food especially valuable to dyspeptics, infants and persons with weak starch digestion."

Wheat tissues are abundant, but none having characters of the oily nuts were found in the flakes. The fat content too is very low. The flakes evidently have been dextrined extensively, but not to the destruction of all starch, as the microscope shows.

#### Rice Products.

Four samples of rice products were submitted:

Agent's No.	Name of Manufacturer.	Name of Cereal.	Name of Dealer.	Price per package. Cents.
H. L. B. 2595.	The American Rice Food and Mfg. Co., Matawan, N. J.	Cook's Malto-Rice, .....	J. C. Barr, Altoona, Pa., .....	15
H. L. B. 2670..	Quaker Oats Co., Chicago, Ill. S. A., .....	Quaker Puffed Rice, .....	Gec. W. Shaffer, Altoona, Pa., .....	10
H. L. B. 5679..	Milkrice Co., Chicago, U. S. A., .....	Milkrice, .....	W. L. Longenicker, Altoona, Pa., .....	15
H. L. B. 3679..	The New England Food Co., South Norfolk, Conn.,.....	Nivara, .....	The Great A. & P. Tea Co., Wilkes-Barre, Pa., .....	12½

## Rice Products.

Manufacturer and Brand.	Agent's number.	Weight.		Moisture. Per cent.	Ash. Per cent.	Fiber. Per cent.	Starch, etc. Per cent.	Fat. Per cent.
		Gross. Oz.	Net. Oz.					
American Rice Co., Cook's Malto-Rice, .....	H. L. B. 2595, .....	15.1	13.4	10.10	.73	7.75	.33	.11
Quaker Oats Co., Quaker Puffed Rice, .....	H. L. B. 2670, .....	10.0	7.8	8.60	.39	7.44	.33	.25
Milk Rice Co., Milk Rice, .....	H. L. B. 2672, .....	10.5	8.1	9.39	.33	7.06	.22	.27
New England Food Co., Nivara, .....	W. A. H. 3691, .....	20.2	18.0	7.07	(2.27)	11.81	.24	.08
Polished rice, average, .....	.....	.....	.....	12.34	(1.64)	7.18	.40	.26
Unpolished rice, average, .....	.....	.....	.....	11.88	1.15	8.02	.33	1.96

\*Salt.

The composition of all but No. 3691 agrees with that stated for raw rice. In No. 3691, the protein is very high. Wiley reports, however, a maximum of 10.33 per cent. for Johore polished rice and of 10.50 per cent. for Japan unpolished rice. The preparation in question has many hairs derived not from rice, but from wheat or barley.

Of No. 2670, Puffed Rice, its label declares "It is very largely a predigested food," because of the action of the heat, but the context of the label leaves no doubt as to the meaning.

No. 2672, Milkrice: The label is so marked as to suggest that the product is in part a milk preparation—which is not the case.

#### Self-Raising Flours.

With the modern tendency to centralization of food production, with the increase of factory operations and the diminution of the housewife's labor in the preparation of meals, a considerable trade has grown up in flours ready mixed with baking powders to serve for the making of pancakes.

The following samples of such preparations were received for analysis:

Agent's No.	Manufacturer and Brand.	Name of Cereal.	Name of Dealer.	Price per Pack- age. Cents.
W. A. H. 3686.....	The H-O Company, Buffalo, N. Y., .....	Presto, .....	S. A. Boyd, Kingston, Pa., .....	10
W. H. 3695.....	F. C. Williams, Easton, Pa., .....	Success Pancake Flour, .....	C. A. Grim, Reading, Pa., .....	10
W. A. H. 3698.....	The Davis Milling Co., St. Joseph, Mo., .....	Aunt Jemima's Pancake Flour, .....	W. H. Moyer, Reading, Pa., .....	10
W. A. H. 3708.....	The H-O Company, Buffalo, N. Y., .....	H-O Buckwheat, .....	J. Sailer, Reading, Pa., .....	15
W. A. H. 3711.....	Potter & Wrightington, Boston, Mass., .....	Self Raising Biscuit Flour, .....	R. E. Seldomridge, Lancaster, Pa., .....	20
W. A. H. 3712.....	Hecker-Jones-Jewell Milling Co., New York City, .....	Old Homestead Flapjack, .....	R. C. Seldomridge, Lancaster, Pa., .....	10
W. A. H. 3713.....	Hecker-Jones-Jewell Milling Co., New York City, .....	Hecker's Self Raising Buckwheat, .....	Fisher Bros., Lancaster, Pa., .....	9
W. A. H. 3716.....	Francis H. Leggett & Co., New York City, .....	Nabob Pancake Flour, .....	Mosemann's Grocery, Lancaster, Pa., .....	10
W. A. H. 3723.....	(Not given), .....	Uncle Jerry's New England Self Rising Pancake Flour, .....	H. M. Schock, Danville, Pa., .....	12½
W. A. H. 3730.....	The H-O Company, Buffalo, N. Y., .....	H-O Pancake Flour, .....	Samuel Sheets, Williamsport, Pa., .....	10
W. A. H. 3731.....	The H-O Company, Buffalo, N. Y., .....	H-O Indian Bread Flour, .....	Blaas Bros., Erie, Pa., .....	10
W. A. H. 3733.....	The Mattie Mitchell Co., Cleveland, O., .....	Mattie Mitchell Cornola Flour, .....	L. H. Roland, Erie, Pa., .....	10

The principal points of examination for these products had reference to the nature of the flour ingredients, to whether or not they had been bleached, and to the kind and approximate quantity of the leavening agent.

The analytical data obtained are as follows:

## Chemical Composition.

Manufacturer and Brand.	Agent's No.	Weight.		Composition.		Acid constituent of the baking powder.
		Gross oz.	Net oz.	Moisture—per cent.	Protein—per cent.	
The H-O (Hornby's Oatmeal) Co.'s Presto, ..... Self-Raising Buckwheat, .....	W. A. H. 3686, W. A. H. 3708, W. A. H. 3739, .....	26.1 24.5 31.2	24.5 32.0 30.3	9.60 10.96 9.27	8.69 10.56 8.81	Sl. 41 77.26 81.10
H-O Pancake Flour, ..... H-O Injun Bread Flour, .....	W. A. H. 3737, .....	29.0	29.0	10.35	8.44	.82
F. C. Williams' Success Pancake Flour, .....	W. A. H. 3695, .....	32.7	30.6	10.07	8.81	.36
Davis Milling Co.'s, Aunt Jermima's Pancake Flour, .....	W. A. H. 3699, .....	38.9	27.2	9.15	9.87	.89
Potter & Wrightington's Old Grist Mill Self-Raising Biscuit Flour, .....	W. A. H. 3711, .....	48.2	45.5	10.40	8.62	.69
Hecker-Jones-Jewell Milling Co.'s; Old Homestead Flanack, ..... Hecker's Self-Raising Buckwheat, .....	W. A. H. 3712, .....	33.6 33.3 30.2	32.0 23.0 28.0	10.16 10.32 9.74	8.37 8.69 9.06	.72
Francis H. Legett & Co., Nabob Pancake Flour, .....	W. A. H. 3716, .....	30.2	28.0	9.74	9.96	1.24
(Not given.) Uncle Jerry's New England Self-Rising Pan Cake Flour, .....	W. A. H. 3728, .....	30.0	28.4	9.89	10.81	1.24
Mattie Mitchell Co.'s, Mattie Mitchell Cornola Flour, .....	W. A. H. 3738, .....	28.2	26.7	10.49	9.82	.645
						.445
						.645
						.550
						.310

These flours showed the presence of no sulphurous acid. Their response to the test for nitrites and the character of their starchy constituents as shown by the microscope, are as follows:

Agent's No.	Test for Nitrites.	Microscopic Characters.
W. A. H. 3686.	Distinct, .....	Wheat flour.
W. A. H. 3708.	Negative, .....	Buckwheat, wheat and corn flours.
W. A. H. 3730.	Faint trace, .....	Wheat, corn and rice flours.
W. A. H. 3737.	Pronounced, .....	Corn and wheat flours.
W. A. H. 3695.	Negative, .....	Wheat and corn flours.
W. A. H. 3699.	Negative, .....	Chiefly wheat and corn flours.
W. A. H. 3711.	Faint trace, .....	Wheat flour.
W. A. H. 3712.	Negative, .....	Wheat, corn and rice flours.
W. A. H. 3713.	Negative, .....	Buckwheat and wheat flours.
W. A. H. 3716.	Negative, .....	Chiefly wheat and corn flours with a little rice.
W. A. H. 3728.	Negative. ....	Wheat, corn, potato and rice flours.
W. A. H. 3738.	Very strong test,....	Wheat and corn flours.

The examination reveals no misbranding with respect to the species of flour used, except in the cases of 3703 and 3713, which have on the principal face of the package in large type the name Buckwheat, though it is explained elsewhere in small type that the articles are mixtures of buckwheat with other flour. It is true, the housewife mixes wheat or other flour with buckwheat in preparing pancake batter; but this does not prevent the labels just mentioned from being misleading. They are distinctly in violation of the U. S. Regulation 17, (h).

The acids of the leavening agents were found to be as represented, usually phosphoric acid. The quantity of baking powder used may be roughly approximated as ten times the total carbonic acid found.

Careful analysis revealed no trace of sulphurous acid, used as a bleaching agent, but several exhibited considerable amounts of nitrous acid, which is used for this purpose; viz: No. 3686, No. 3737 and No. 3738.

The sale of flours that have been bleached should not be permitted without a proper declaration of this treatment; for, while it may be said that the effect of the treatment is an improvement in the appearance of the flour, the real object is to make possible the sale as a high grade article of flour known by its color to be an inferior product. It is thus in violation of the spirit of the fourth article of Section 5 of the Act of June 1, 1907, which defines a food as "adulterated" "If it be mixed, colored, powdered, coated, or stained in a manner whereby damage or inferiority is concealed." It is not only in violation of the spirit of this article of the Act, but also contrary to its letter, if the definition of the verb "stain" be held to be "discolor;" that is, "to alter the natural tint or hue." U. S. Regulation 12, (e), embodies this view. It says, "The term 'Stain' includes any change produced by the addition of any substance to the exterior portions of the food which in any way alters their natural tint."

The justice of this interpretation appears more fully upon a consideration of the claims upon the labels of two of these preparations in question. That of No. 3686 says, "Presto is composed of perfectly milled, pure and highest quality of blended winter wheat combined with absolutely pure Cream of Tartar and Soda, etc."; that of No. 3738 says "MATTIE MITCHELL—CORNOLA FLOUR.—Self-rising—Every article having the above Trade Mark is guaranteed to be absolutely Pure and Strictly High Grade."

### General Summary.

The results of this investigation show clearly that the materials used in preparing the cereal breakfast foods are wholesome grains or some of their more valuable products, and that the addition of bran, corn cob, corn stalk, etc., sometimes said to be used as adulterants, is purely imaginary.

Furthermore, the samples exhibited a good condition of dryness, but many were wormy when received.

In general, they exhibited no evidence of the use of bleaching agents, except in the case of a few pancake flours.

The test for tonic materials, such as strychnin, and also for morphin, were negative.

On the other hand, the net weights contained in the packages were most variable.

The representations concerning the chemical composition and nutritive value of the preparations were often very highly misleading, and sometimes utterly reckless.

The cost of these foods was low if they are regarded as confections to please the taste, but very high if they be treated as substitutes for the ordinary domestic cereal products.

Very respectfully,

WM. FREAR,

State College, Pa.,

December 23, 1907.